

mike Tash. R+M

1/8" recommended.

**MODEL 910A AIR SAMPLER
OPERATIONS AND MAINTENANCE
MANUAL**

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ROBERT STEEL AIR SAMPLER FOR
OPERATIONS AND MAINTENANCE
MANUAL

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GENERAL DESCRIPTION

The Model 910A sampler is designed to collect ambient air pressurizing the air into a 'Summa' electropolished canister for subsequent laboratory analysis.

- The basic system employs a stainless steel and Viton diaphragm pump that will typically deliver pressures greater than 30 psig. The system has been designed to operate (with the inlet open to atmospheric pressure) at 25 psig, with a bypass flow of not less than one liter per minute (normally, average bypass flows exceed two liters per minute).
- A precision metering needle valve (PRESSURE ADJUST), or an adjustable relief valve, controls the bypass flow. Subsequently setting the pump back-pressure, as indicated on the (PUMP PRESSURE) gauge will effectively set the inlet pressure to the mass flow controller. The greater the pump back-pressure, the lower the subsequent bypass flow.
- An in-line capillary tube (approx. 10" to long, 1/16" O.D., with a 0.03" I.D.), or a stainless steel sintered metal disc (1/8" O.D. x 1/16" thick, with a nominal pore size of 10 microns), is used to dampen the pulsation's between the pump and the mass flow controller.
- This same sintered disc is used to dampen the pulsation's to the pump pressure gauge.
- A "thermal absorbency" controlled proportional valve constitutes the heart of the systems mass flow controller. The signal input to the mass flow controller is set with a precision 10 turn counting dial (FLOW ADJUST) and potentiometer. The output signal from the mass flow controller is read directly on a digital LCD panel meter (FLOW cc/min.). These three components constitute the flow control system. The system has been calibrated at the operational mid-point of the mass flow controller.
- The flow is directed through a normally closed, three way, impulse latching, solenoid valve. A latch pulse from the control board directs the flow to the outlet port and the front panel (CANISTER PRESSURE) gauge. A release pulse vents the flow within the chassis.
- Operation of the system is controlled through the SPDT relay contacts of the programmable timer, and the logic circuitry of the internal printed circuit board. The timer is programmed with the time (24 hour format), the day of week (as indicated by the number under the day), and the desired turn on/off (two event) sampling episode.
- A totaling counter (SAMPLE HOURS) indicates the elapsed sampling time. The counter is logically controlled to come on with a latch pulse to the solenoid valve, and off with a release pulse. This feature conveniently allows for programming verification at the end of the event.

LIST OF APPENDICES

(MANUFACTURERS DATA SHEETS)

			P/N
Appendix A:	Porter Instrument Co.	mass flow controller	201-DTASVBCB
Appendix B:	KNF Neuberger	pump	(Basic) MPU638-N05-1.94 (CARB) MPU781-N010-9.95
Appendix C:	Burkert	solenoid valve	455243D
Appendix D:	Theben	elapsed time switch	(Basic) TR 684 S-1
Appendix E:	Datel	panel meter	DM-3100U1-1
Appendix F:	Veeder-Root	hour meter	C342
Appendix G:	Power-One	DC power supply	HAD15-0.4-A

LIST OF DRAWINGS

System Flow Diagram

Wiring Diagram for Model 910A Basic

Schematic Diagram

UNPACKING INSTRUCTIONS

Before removing the sampler from the shipping container, inspect the container for evidence of shipping damage or mishandling. If such evidence is present, a report should be filed with the carrier as soon as possible. Do not remove or operate the sampler if damage is evident, until the carrier has had an opportunity to verify the damage. Do not discard any packing material.

After unpacking the sampler, check it carefully for evidence of shipping damage or rough handling. Remove the top cover and inspect for any damage or loose components. It has come to our attention that under certain conditions, shipping vibration can cause some of the tube fittings to loosen. Newer versions of the Model 910A are being fitted with a captive foam damper between the chassis side wall and the inner-mounting bracket.

CAUTION

This sampler has been cleaned in the laboratory, and care should be taken to avoid contamination. For laboratory testing, connect the sampler inlet to a humidified zero air or other suitable clean air supply, collect the air sample into a clean canister and analyze the sample.

NOTE

Before you plug in the sampler, insure that the power switch is in the off position.

The sampler will automatically come on (pump and fan will run) when the power switch is turned on. It is normal for the sampler to run for a period, as set by the purge delay. Circuitry to purge the sampler before each sampling period does not get reset until approximately 45 seconds (basic purge delay) after power is turned on, or after a power interruption.

If a purge delay circuit board is installed, the initial power on condition will only momentarily (about one second) run the pump and fan.

Turn on the power switch, the switch will be lit, the pump and fan will come on momentarily.

The current time (PST) should be displayed on the timer, or it will be 00:00 if the timer has not had power applied within the last 2 weeks. In the event the display is blank, refer to timer program instructions in Appendix D, press the reset button with a suitable blunt probe tip, and set the year, date and time.

The flow display should indicate a plus sign, and zero flow to the first decimal point. A slight offset indication, due to electronic biases is normal in this condition, and will not contribute to operational errors.

SAFETY PRECAUTIONS

Insure that the equipment is unplugged before removing the cover. Once the cover is removed, this instrument has exposed 110 VAC power.

Some maintenance described herein may be performed with power supplied to the instrument and protective covers removed. Only qualified service-trained personnel should perform maintenance. Where maintenance can be performed without power applied, the power should be removed.

This instrument is not unique in its content of ESD (electrostatic sensitive device) components. Static electricity can damage or destroy these devices; service personnel should adhere to standard practices for handling ESD components.

HANDLING PROCEDURES

1. Power to unit must be removed.
2. Personnel must be grounded, via a wrist strap or other suitable means before any printed circuit card or other internal device is installed, removed or adjusted.
3. Printed circuit cards must be transported in a conductive, anti-static bag or other suitable container. Boards must not be removed from protective enclosure until the time of installation, or replacement. Removed boards must be immediately placed in protective container for transport, storage, or return to factory.
4. Before any repair is completed, ensure that all safety features are intact and functioning, and that all necessary parts are connected to their protective grounding means.

XONTECH MODEL 910A CANISTER SAMPLER STARTUP SUMMARY

Refer to the 910A, 912 and Purge Delay Option manuals for detailed instructions on performing the following actions.

1. Unpack the 910A, check for shipping damage.
2. Connect the "Inlet" fitting to the sample source.
3. Connect the power cord to a 110 VAC, 60 Hz outlet. Turn power on and reset program timer. Set clock time (refer to appendix D).
4. Remove dust cover on timer and press the top button once or twice (with the hand). Set pump pressure and sample flow. The pump pressure should be set to 25 psi. Press top button twice to shut down the unit and replace dust cover (refer to appendix D: for operation of elapsed timer switch).
5. Attach a canister or the Model 912 Multi-Canister Sampling Adapter to the "Outlet" fitting and open the canister valve.

If a Model 912 is used, install the control cable, connect the canisters to the outlet ports, open the canister valves and select the step rate (factory set to 3 hours). Refer to the Model 912 Multi-Canister Sampling Adapter manual for instructions on selecting the step rate.

6. If the 910A was supplied with the Purge Delay Option the delay is factory set to 5 minutes. Refer to the Purge Delay Option manual for instructions on selecting other delay times.
7. Program the timer with the desired sampling times.

If the 910A was supplied with the Purge Delay Option be sure to read the section titled Setting The Sampling Period in the Purge Delay Option manual. If a Model 912 is used be sure to read the section titled Operation in the Model 912 manual.

Set the timer to "run mode" (clock display, lower left-hand corner).

8. If a Model 912 Multi-Canister Sampling Adapter is used, connect the power cord to a 110 VAC, 60 Hz outlet. Turn the Model 912 power on and advance the valve position to the first canister to be filled.

Note: When using the 912 with the 910A the "Continuous/Normal" switch should be left in the "Normal" position.

The 912 uses internal timing logic to step the multi-port valve at a preset rate. This timing logic is enabled when the 910A is sampling (after the purge delay).

The timing logic is only reset to zero when the 912 power is first turned on (manually advancing the valve does not reset the timing logic). The 912 power should be turned off (for about 10 seconds), and on again after programming a new sampling sequence and loading new canisters. The 912 power should not be turned off and on during a sampling period, as this will reset the timing logic and cause the valve to step out of sync with the 910A. Power failures lasting longer than a few seconds will have the same effect. If your sampling site experiences frequent power failures, the use of a battery back-up system such as the Trip Lite BC-400LAN is recommended.

9. The 910A is now ready to sample at the programmed times.

FEATURES

- Precision Mass Flow Controller to maintain constant, flow rates.
- Accurate ten turn dial-indicating control to set flow rate.
- Easy to read, LCD digital display, reads directly in sampling units "cc/min."
- Convenient front panel access to all indicators and controls.
- Reliable electronic, quartz controlled, LCD digital display, programmable timer, with 24-hour or 7-day schedules (with 8th day or holiday schedule), 42-event, capability for presetting sample periods.
- Dependable electronic, quartz controlled, elapsed time indicator, with flashing run feature, to show actual sampling time. Eight digit LCD display in "hrs." min" or "hrs.01" minutes.
- Easily accessible inlet, outlet, and exhaust ports are located at the rear of the sampler.
- Durable, lightweight aluminum chassis, for bench top or standard 19" rack mountable installations.
- All wetted components are non-reactive, stainless steel, Teflon, and/or Viton.
- Short flow path tubing assembly construction, minimizes possible contamination in dead ends, and allows easy disassembly for cleaning.

NOMENCLATURE (AS THE EQUIPMENT LABELS READ)

FRONT PANEL

- **(POWER)** switch - Rocker type, lighted to indicate on. When this switch is depressed to the up position, (*or to the right on older systems*) the system power is on, down (*or left*), is off.
- **(PUMP)** - switch - Used for pre-purge in older systems, has been eliminated.
- **(FLOW ADJUST)** - a 10 turn counting dial and potentiometer used to set the input reference voltage to the mass flow controller. It is set so that 5.0 on the dial is 50% of the full scale output flow rate of the mass flow controller.
- **(FLOW cc/min.)** display - This display is calibrated to the output flow signal of the mass flow controller at mid-scale settings.
- **(PRESSURE ADJUST)** - This metering needle valve controls the bypass exhaust, maintaining the back-pressure as indicated on the (Pump Pressure) gauge. Turning the valve clockwise will increase the pressure and reduce the bypass flowrate. This valve should be set so that the pressure is greater than 5 psig above the desired canister end pressure.
- **(PUMP PRESSURE)** gauge - Reads the pump back-pressure held by the pressure adjust valve, and represents the sample inlet pressure to the mass flow controller.
- **(CANISTER PRESSURE)** gauge - Indicates the condition at the outlet port.
- **(SAMPLE HOURS)** - This timer shows the elapsed sampling time in hours and minutes, or hrs. 01 min. Reference Appendix F.
- **Timer manual override button** and programming is described in Appendix D.

REAR PANEL

- **Power Cord** - Attach power cord to grounded 3 wire 110 VAC, 60 Hz outlet.
- **Power (FUSE)** - The power fuse is a 3A Slow Blow fuse.
- **Sample (INLET)** - The sample input port is a stainless steel 1/4" Swagelok fitting..
- **Sample (OUTLET)** - The sample output port is a stainless steel 1/8" Swagelok fitting.
- **(BYPASS) Exhaust** - The bypass exhaust port is a stainless steel 1/8" Swagelok fitting.

SETTING SAMPLER FLOW RATE

1. Attach a source of zero air to the sample inlet. Remove the caps from sample outlet and bypass ports.
2. Set the flow adjust potentiometer to the desired flow rate. A setting of 5 on the potentiometer will be 50% the full scale range of the mass flow controller, as read in cc/min. on the flow display.
3. Remove the timer cover, press the top button (with the hand) once or twice to run the unit manually. After the pre-purge delay (45 seconds for a basic system), the solenoid valve should click (latch open) and the outlet flow should rise to the set value. The elapsed time hour meter will indicate a flashing running time indicator “.”.
4. Adjust the pump pressure, normally 25 psig, unless special calibration is applicable.
5. Adjust the flow rate as necessary to set the exact flow rate.
6. Push the top button (with the hand) twice to shut off the unit. Replace the timer cover, and reset the hour meter.

FLOW CALIBRATION

The system has been calibrated for optimum performance at the mass flow controllers mid-point of operation. If calibration at some other specific point of operation is desired, recalibration may be achieved.

1. A comparative verification of the flow rate may be achieved by attaching a transfer flow standard to the sample outlet port.
2. Set the flow adjust control to the desired output level. Verify that the dial and the input control voltage to the mass flow controller agree. Readjust the dial if necessary.

The mass flow controller is operating correctly and controlling at the setpoint, if the output flow signal agrees with the input setpoint voltage. These voltage points may be monitored at the mass flow controllers cable connector (J10 on the PCB), pin 1 (blue wire) is the output flow signal, pin 2 (gray) is the input setpoint voltage. Use pin 6 (black) for common.

If necessary, the digital meter may be calibrated with the full scale potentiometer located in the meter and accessible from the back of the meter. As viewed from the rear, the full scale pot is on the right and gain pot is on the left.

SAMPLING

1. Connect sample inlet line to sample source.
2. The desired flow rate can be calculated using the equation provided by USEPA Method T0-14 Section 9.1.3.1.

$$F = \frac{P \times V}{T \times 60}$$

where F = flow rate in cc/min.

P = final canister in atmosphere absolute

V = volume of canister in c.c.

T = sampling period in hours.

Example: If a 6-liter canister is to be filled to 2 atmospheres absolute in 3 hours, the flow rate can be calculated using the equation.

$$\begin{aligned} F (\text{cc/min}) &= \frac{2 \text{ atm} \times 6000 \text{ cc}}{3 \times 60} \\ &= 66.6 \text{ cc/min.} \end{aligned}$$

3. Program the sampling interval, refer to Appendix D for programming instructions.
4. Reset the elapsed time counter.
5. Attach canister to the outlet port, open canister valve. The canister gauge should indicate vacuum.
6. When sampling is complete, close the canister valve, and remove or replace the canister.
7. Reset the system for the next sampling episode.

SHUTDOWN

1. When the sampler is to be shutdown, place the timer switch in the off position and turn off the power switch.
2. Install caps on the sampler inlet, outlet and exhaust ports.

CLEANING PROCEDURE

To comply with the cleanliness requirement, it has been found that by using an ultrasonic cleaning technique on all the stainless steel fittings and parts which will contact the sample, the specified levels of cleanliness can be achieved.

EQUIPMENT REQUIRED

Zero Air (do not use the house air supply)
Ultrasonic cleaner
Liquid separator trap
Lab liquid detergent solution
Distilled deionized water
Acetone free methanol (refer to MSDS for handling).
Oven at 200°C (392°F) A vacuum oven with a zero air purging supply is recommended.
Common hand tools
Kimwipes

PROCEDURE

1. Remove all tubing and fittings from the system. Use *Procedure A* to clean all stainless steel parts. Use *Procedure B* to clean all Viton and Teflon parts, or stainless parts with attached seals.
2. Remove the needle valve from the front panel. Disassemble the valve by removing the stem from the body. Clean the body by *Procedure A*. Clean the stem with the O-rings by *Procedure B*.
3. Cleaning the diaphragm pump:
 - 3.1 Attach a liquid separator trap to outlet port of the pump.
 - 3.2 Attach a tube to the pump inlet, and connect a clean funnel to the other end.
 - 3.3 Apply power to the pump and allow it to run. Slowly pour about 50 cc of methanol through the running pump.
 - 3.4 Remove the inlet tube assembly, and replace it with a tube assembly that will supply about 1 liter per minute zero air or clean purge gas. Allow the pump to purge for about 30 minutes. NOTE: Do not allow methanol to stand in the pump or it will ruin Viton diaphragm and valves.

If the cleaning procedures outlined above do not sufficiently clean the pump, disassemble the pump head; clean the stainless steel parts using *Procedure A*. Use *Procedure B* to clean a new diaphragm and valve. Replace the Viton diaphragm and valve assembly. Repeat Procedure 3.1 - 3.4 above.

Procedure A

1. Wash with liquid detergent solution.

Put liquid detergent solution in the ultrasonic cleaner. Be sure liquid passes through all parts of tubing. Ultrasonic for 10 to 15 minutes. If a part cannot be completely immersed, rotate the part, and ultrasonic for an additional period.

2. Drain the detergent solution.

3. Three rinses using distilled deionized water.

Put clean distilled water in the ultrasonic cleaner. Be sure liquid passes through all parts of the tubing. Ultrasonic for 10 to 15 minutes. If a part cannot be completely immersed, rotate the part, and ultrasonic for an additional period.

4. Blow dry with zero air or compressed nitrogen.

5. Three rinses with methanol.

Put methanol (absolute) in the ultrasonic cleaner. Be sure liquid passes through all parts of the tubing. Ultrasonic for 10 to 15 minutes. If a part cannot be completely immersed, rotate the part, and ultrasonic for an additional period.

6. Blow dry with zero air or compressed nitrogen.

7. Place parts in a clean, purged, vacuum oven at 150°C for overnight (12-16 hours).

Procedure B

1. Wash with liquid detergent solution.

Put liquid detergent solution in the ultrasonic cleaner. Be sure liquid passes through all parts of tubing. Ultrasonic for 10 to 15 minutes. If a part cannot be completely immersed, rotate the part, and ultrasonic for an additional period.

2. Three rinses using distilled deionized water.

Put clean distilled water in the ultrasonic cleaner. Be sure liquid passes through all parts of the tubing. Ultrasonic for 10 to 15 minutes. If a part cannot be completely immersed, rotate the part, and ultrasonic for an additional period.

3. Blow dry with zero air or compressed nitrogen.

4. Dampen a Kimwipe with methanol and wipe part clean.

CLEANING THE MASS FLOW CONTROLLER

It is not recommended that the mass flow controller be disassembled or cleaned by persons other than factory trained individuals. Disassembly and cleaning may necessitate recalibration. Please refer all non-warranty repairs directly to the manufacturer.

KEEPING THE SYSTEM CLEAN

Whenever the system is shutdown pass clean air through the system, replace suitable caps on the sample inlet, sample outlet, and bypass exhaust ports so that atmospheric impurities do not diffuse into the system.

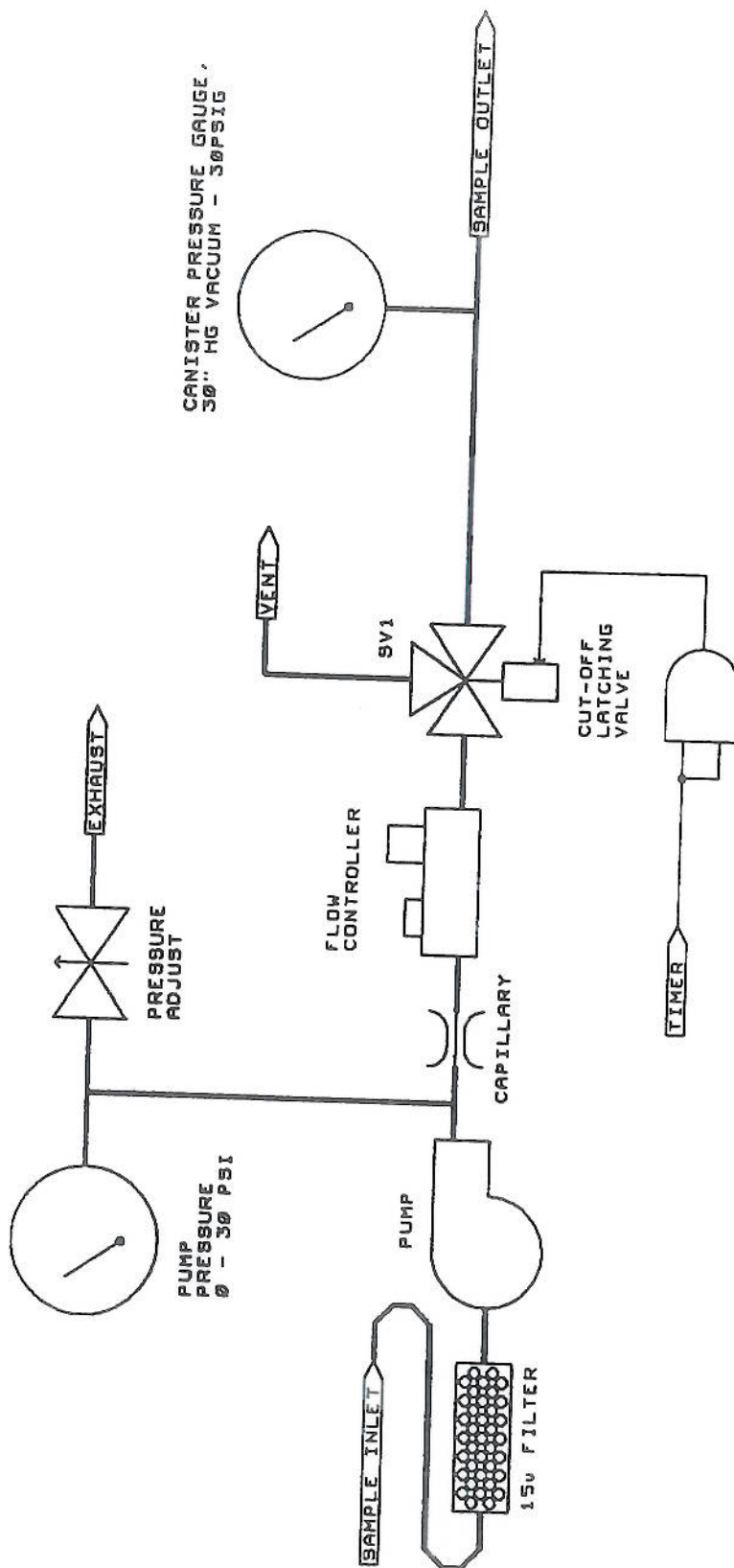
Manufacturer	Part Number	Description
AMP	583764-1	KEY
AMP	583853-4	PIN
AMP	583718-1	CONNECTOR, 20 CKT.
BECKMAN	2606	DIAL, TURNS COUNTING
BOURNS	3006P-1-503	TRIMPOT, 50K
BURKERT	455243D	SOLENOID VALVE, 3-WAY, 120/60 IMPULSE
CALDYN	KT-245	SHOCK MOUNT, L-1/2" D-9/16" S-3/8"
CAPSTAN	2-1FCR-2030	FILTER DISC, SS, 1/8"O.D. X 1/16"THICK
CONXALL	7280-7PG-300	CONNECTOR, 7 PIN
CONXALL	6295	DUST CAP
CRAWFORD	SS-T4-S-035	TUBING, T-316, 0.250 OD, 0.035 WALL
CRAWFORD	SS-T2-S-028	TUBING, T-316, 0.125 OD, 0.028 WALL
DATEL	DM-3100U1-1	DIGITAL PANEL METER, LCD
FAN-S	08172	FAN GUARD, 2.82 MTG. (EL COM)
HH SMITH	8217	HEX STANDOFF, 1/4" X 3/8" LG., 4-40, M/F
HH SMITH	2334	HEX STANDOFF, 1/4" X 1" LG., 4-40
LITTLEFUSE	313003	FUSE, 3 A, SLO-BLO
McMASTER-CARR	9723K28 (64/PK)	ADHESIVE BACKED FOOT
MOLEX	22-01-3027	CONNECTOR, 2 CKT.
MOLEX	22-01-3067	CONNECTOR, 6 CKT.
MOLEX	22-01-3087	CONNECTOR, 8 CKT.
MOLEX	03-09-1064	CONNECTOR, 6 CKT.
MOLEX	03-09-1032	CONNECTOR, 3 CKT.
NEUBERGER	MPU781-N010-9.95	PUMP, SS, TEFLON, 115VAC (CARB) KNF
NEUBERGER	PK05-002	VITON DIAPHRAM KIT (N05-TYPE) KNF
NEUBERGER	MPU638-N05-1.94	PUMP, SS, VITON, 115VAC KNF
NMB TECH. INC.	3110 PS 12W B30	FAN, MINI BOX, 115 VAC, 2.82 MTG.
NUPRO	SS-2MA	VALVE, METERING, ANGLE
PORTER	201-DTASVBCB	MASS FLOW CONTROLLER
POWER ONE	HAD15-0.4-A	POWER SUPPLY, +/-15 VDC
RMESI	910A6013 REV-G	FRONT PANEL
RMESI	910A6161-1 REV-G	MODEL 910A CHASSIS ASSY
RMESI	520C6152 REV-C	MFC/SOL MOUNTING BRACKET
SCHURTER	4303.2907	KEC FUSE DRAWER
SCHURTER	4303.5014	POWER INLET SOCKET W/FUSE HOLDER
SELECTA	SS-951-BG	ROCKER SWITCH, LIGHTED, DPST
SPECTROL	536-1-1-502	POTENTIOMETER, 10 TURN
SWAGELOK	SS-401-PC-2	REDUCING PORT CONN., 1/4" T - 1/8" TX
SWAGELOK	SS-200-P	PLUG, 1/8" TUBE
SWAGELOK	SS-201-PC	PORT CONNECTOR, 1/8" TUBE
SWAGELOK	SS-200-61	BULKHEAD UNION, 1/8" TUBE
SWAGELOK	SS-200-7-4	FEMALE CONNECTOR, 1/8" T - 1/4" FNPT
SWAGELOK	SS-400-61	BULKHEAD UNION, 1/4" TUBE
SWAGELOK	SS-200-1-2	MALE CONNECTOR, 1/8" T - 1/8" MNPT
SWAGELOK	SS-400-6-1	REDUCING UNION, 1/4" T - 1/16" T
SWAGELOK	SS-400-2-2	MALE ELBOW, 1/4" T - 1/8" MNPT

order from
RMESI

SWAGELOK	SS-100-R-2	REDUCER, 1/16" T - 1/8" TX
SWAGELOK	SS-400-P	PLUG, 1/4" TUBE
SWAGELOK	SS-200-3	UNION TEE, 1/8" TUBE
SWAGELOK	SS-400-3	UNION TEE, 1/4" TUBE
SWAGELOK	SS-200-7-2	FEMALE CONNECTOR, 1/8" T - 1/8" FNPT
SWAGELOK	SS-400-1-2	MALE CONNECTOR, 1/4" T - 1/8" MNPT
THEBEN	TR 684 S-1	PROGRAM TIME SWITCH
U.S. GAUGE	153098 (DRY)	GAUGE, SS, C552LX, 30-0-30 PSI
U.S. GAUGE	138002 (P844U)	GAUGE, 2 IN, 0-30 PSI, 1/8 ANPT CBM
VEEDER-ROOT	C342-2464	HOUR METER, (HRS.00)
VOLEX	17250-B1-10	POWER CORD, 3 COND. 18 AWG, 7' 6"

DRAWINGS

FLOW DIAGRAM, MODEL 910A CANISTER SAMPLER



XonTech, Inc.
Van Nuys, CA
910FLO-1.DIA

100%
100%
100%



20-40
20-40
20-40